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THE GRAMMAR OF CLASSIFICATION.

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Introduction.

A paper on "The Principles of Classification" appeared as Library Assistants' Association Series, No. 1, in 1908; and for some time this and the number of *The Library Assistant* in which it originally appeared have been out of print. The demand for it still continues, however, and rather than reprint the paper, I have written a new one covering the same ground at rather greater length, and have added a few of the results of experience as a teacher of the subject.

Mr. E. Wyndham Hulme has written a valuable series of papers[1] in which he controverts many of the principles here laid down, and attempts to distinguish ideas and the expression of them (books) as two different entities, and rejects the theory that bibliographical classification is dependent upon philosophical classification. In common with other classifiers I find myself unable to accept this view, and the following paper depends philosophically upon two postulates:

> That classification is an attempt to arrange all being in series to produce a microcosm of all knowledge past, present, and future—irrespective of form or expression;
>
> That bibliographical classification is the classification of knowledge with definite practical adjustments conditioned by the physical form of books.

Grammar is not, save to a privileged few, a very entertaining subject, and I have given this unattractive title to this paper to convey some idea of the concentration in thought and expression necessary to compress a large subject into twelve pages. It is written for the student, and does not aim to furnish entertainment—at least, not consciously.

[1] *The Library Association Record*, v. 13, p. 354, 1911, *et sequitor*.

Principles.

1. Classification is the primary process of the reason in identifying any object. It is a process in which, by aid of memory and reason, we recognize resemblances and differences in all things we perceive or conceive, and arrange these things by some characteristic into groups or classes in which these resemblances and differences are made apparent. The law of association, which is the outcome of our experience, or memory, enables us to recognize that many objects have properties in common. When a *table* is named, this law immediately brings before our mind an object with a horizontal bearing surface, used for various purposes, supported by legs or pedestals. The law relates it by its resemblances and differences to its *class*—tables. A class, then, is a series of things having some feature in common which we may call the *characteristic* upon which the class is formed.

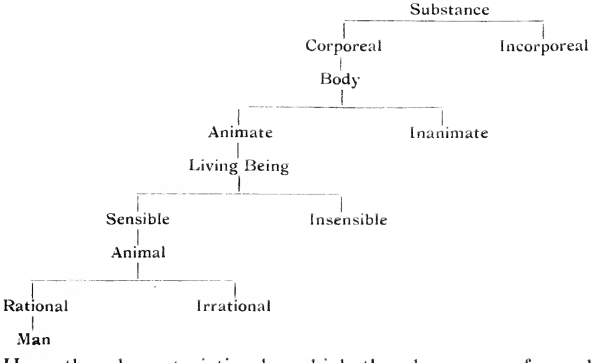
2. Class is a term of varying power and may be of large or small extension; anything that may be divided into species by some *difference* in the things forming it may be a class. Hence, in our class, tables, we have a term of great extension including every kind of table, of whatever size, shape or material, or for whatever purpose designed. This large class we can divide into species by naming the *difference*, which is a quality added to the class or genus. Thus, dining-tables exhibits in the word "dining" the added quality of "the purpose of the table," which is the difference marking it off from billiard, roulette, drawing-room or other tables, which in turn are marked off from one another and other tables by their differences. In regard to tables, which is here the genus, dining, billiard, roulette, or other tables are species, but in regard to the members forming the species, each of the species may itself become a genus. Thus, dining-tables may be distinguished by adding the difference of their shape or the material of which they are made. Round-dining-table, and rectangular-dining table, are two distinct species of dining tables. Again, either of these may become a genus if we seek to break it up into further species. The genus round-dining-table, may be divided into the species mahogany-round-dining-table, walnut-round-dining-table, and so on. And this process of narrowing the extension and deepening the intension of any class of objects may be continued so long as there are any differences at all by which two things can be distinguished one from the other. Here, then, we have the fundamental

definition of classification: *The arranging together of things in the order of their degrees of likeness, and the separation of things according to their degrees of unlikeness.*

3. *Recapitulation:* A class is any group of things, having a common quality (it is hence a *genus*), which may be broken into divisions (species) by its differences. A class may be divided and redivided into any number of sub-classes until identity is reached.

4. The material of classification is unlimited. We have seen that it includes all things we may perceive or conceive. Thus, we naturally mark off into their respective classes all things that had, have, or may have a being, whether in the objective or subjective experience of man. *A general classification must by its very nature provide a place for every thing past, present or possible.*

5. In its natural processes the mind arranges things first into large groups, positive and negative. Porphyry in his Ramean Tree divided as follows:—



Here the characteristics by which the classes are formed are the obvious ones of body, life, sense, and reason. The re-division of these is a more advanced process.

6. The characteristics chosen to form the basis of the class may be natural or artificial. A natural characteristic is a property inherent in the thing classified, and without which it would not be the thing it is. An artificial characteristic is some accidental property, not necessary to the thing. For example: a natural classification of the alphabet, which consists of the symbols of articulate sound

and apart from what they represent have no significance, would be by the parts of the mouth and throat brought into action by their pronunciation; an artificial classification might arrange them by their position on above or through the line, a pure accident of form.[1] Again, a natural classification of men could arrange them by the shape of their hair in section, which is circular in Caucasians and oval in Mongolians; an artificial arrangement would group them by colour.

7. Although the student will immediately assume that the natural characteristic is to be preferred, and in general will be right in the assumption, it is not always so. Apart from the fact that it is not always possible to recognize the natural characteristic—a statement borne out by the Linnaean classification of plants—and that classification is merely an arrangement of our concepts of things, and these are constantly changing; classification is a practical thing, and the characteristic chosen should be that most useful to the person for whom the classification is made. A botanist will require an arrangement of countries different from an anthropologist, an ornithologist another arrangement of birds than that required by a chef. The whole function of a classification is to arrange things by the characteristic essential to the purpose of the user of the classification.

8. *Recapitulation.* All being is the material of classification. This the mind first arranges into large groups by obvious characteristics. Characteristics may be natural or artificial properties of the things classified, and a natural or artificial charactistic may form the base of arrangement, the determining factor being the purpose of the classification.

9. In planning a classification, whatever be the characteristic chosen for division, this must be adhered to throughout. In our example, tables, we classified by the *purpose*, and as long as we proceed we must adhere to purpose, or *cross-division*—a most potent source of confusion—will result; thus, in the following:—

Tables
1. Kitchen Tables.
2. Drawing Room Tables.
3. Dining Tables.
4. Roulette Tables.
5. Mahogany Tables.
6. Whist Tables.
7. Square Tables.

[1] This excellent example was given by Mr. L. Stanley Jast in his lectures on our subject at the London School of Economics.

we have a ridiculous result, in that the sequence is crossed at 5 and 7 by two characteristics different from the chosen one. Clearly any of the objects in 1, 2, 3, 4, and 6 may be square or wooden, and the converse is of course true.

10. This consistency of characteristics is closely related to another important principle of classification, which is: The headings used must be mutually exclusive, and subjects named must not overlap one another. In our example it is seen that square tables may overlap dining or any other kind of tables; but in the properly designed classification this could not occur. All the subjects connoted by any class name must be included under that name, and all others must be excluded. Thus in an arrangement of Botany:—

> Acotyledons (without seed-lobes).
> Monocotyledons (having one seed-lobe).
> Dicotyledons (having two seed-lobes).

It is quite clear that each division is self-contained and excludes everything in the other two.

11. We have now seen that a classification is a mapping out of the field—or a field—of knowledge into broad groups called classes; that these classes may be divided into smaller classes called divisions; that the divisions may be divided and redivided in smaller sub-divisions and sections, until the single thing, or identity, is reached; that any characteristic may be the principle of division so long as it is that most useful to the classifier; that the characteristic must be consistently followed throughout; and that the headings must be mutually exclusive. The resulting tabulation or map is what is called a *schedule*, and the order in which the classification divides is its *hierarchy*.

12. The names given to the headings—main classes, divisions, sub-divisions, sections and sub-sections—are the *terms* of the classification. Just as a characteristic must be invariable throughout a schedule, so the terms throughout must have an invariable meaning. It is clear that "sharp" when applied to a knife is different from the same word applied to a boy; either is a correct use, but unless we understand the particular use confusion is inevitable. So in the schedule we may use words in any sense we please, but the sense chosen must be the same throughout, and be so understood.

13. In constructing the hierarchy the steps in the process of division must be gradual, each step coming

naturally from the term before it and modulating into the one beneath it: in some such fashion as follows:—

Universe.
Solar system.
Planets.
Earth.
Eastern Hemisphere.
Europe.
Britain.
England
Middlesex.

The slower the process of division the more perfect will the hierarchy be.

14. No schedule can be perfect which is not flexible and expansible, permitting the insertion of any new subject or phase of a subject at its most nearly related heading. It is conceivable that the Solar System may be a part of some larger system which is, however, smaller than the Universe. A schedule must permit the insertion of the name of the new system in between Universe and Solar System. Thus a properly designed classification cannot become obsolete, except through some radical change in the order of our knowledge of the subject classified, which may throw the whole schedule out of gear by rendering the characteristic of division and the terms obsolete. This is possible, and, in the light of history, probable.

15. *Recapitulation.* A schedule is a map of a subject arranged into classes and sub-classes; the order of the arrangement is the hierarchy; the terms in the hierarchy must be used in an invariable sense throughout; the process of division must be by gradual steps; and the hierarchy must be expansible, in order to admit the intercalation of any newly-discovered subject. The resultant schedule, which is a microcosm of knowledge, is a *knowledge*, or *philosophical classification*.

Bibliographical Classification.

16. Bibliographical classification differs from philosophical classification in being the latter adjusted to accommodate books, and is consequently largely artificial. Any philosophical scheme, with additions, excisions, and adjustments, conditioned by the physical form of books, may be a bibliographical scheme. The adjustment is secured in various ways, but the main ones are these: by the addition of:

A generalia class.
Form classes.
Form divisions.

These are purely artificial classes in which the characteristic of the "form" of the book itself, or the form in which its subject matter is treated, predominates. In addition, a bibliographical classification demands:

A notation.
An index.

17. A *generalia*, general works, or miscellanea class, as it is variously called—such as A in Brown, O in Dewey, A in Cutter, L in Quinn-Brown, A in the Library of Congress scheme—is necessary because many works are of so composite a nature that they do not fall into any specific subject class, but overlap several or all of the classes. Such works are newspapers, general periodicals, encyclopaedias, etc. Into this class also fall such subjects as are pervasive of all others, as bibliography. A generalia class is therefore for works which will not conveniently go anywhere else in the classification.

18. *Form* classes are those main divisions of the scheme in which the books are grouped not by their subject matter but by the form in which that matter is presented. These include poetry, the subject matter of which may be love, religion, wine, patriotism, or what not, but which always has metrical form; drama; prose fiction; general essays, letters, oratory, humour. A generalia class is a form class to some extent, the form being the *formlessness* of the majority of the books included in it.

19. When we speak of form in classification we must be careful to understand that there are two kinds of form, *outer* and *inner*. The outer form is objective—the actual physical structure of literary work; thus, encyclopaedias have a definite physical character, poetry has the outer form of metre, and so on. Inner form is subjective—a method of conveying a subject; hence, when we think of a history of chemistry we have, according to our rule that the subject is the predominating characteristic in classification, a work on a specific subject, chemistry; but it is presented in the form of a history. *The Philosophy of Art* is a work on art in the form of philosophy, a *Theory of Currency* is a work on currency in the form of theory. In form classes, and more particularly in form divisions, both inner and outer form are sometimes present.

20. At the beginning of each class in the Decimal classification the following places occur with small variations:

0. The subject in General.
1. Philosophies. Theories. Methods.
2. Compends, Outlines.
3. Dictionaries, Cyclopædias.
4. Essays, Lectures, Addresses.
5. Periodicals, Magazines.
6. Societies, Transactions.
7. Education. Methods of Teaching and Studying.
8. Polygraphy, Collected Works, Extracts.
9. History.

These are *form divisions* which may be defined as the generalia divisions of specific classes. If these form divisions were applied to science, for example, every work included in the divisions would be a work upon science treated generally but in some special form; except the division marked O which would be the main heading, Science, and would take general works on science not clearly belonging to one of the form divisions; these, however, in the example would be few. The two periodicals *The Spectator* and *Nature* illustrate the difference between the general periodical and the general special periodical. The former covers practically everything, the latter covers everything within the limits of science.

Most bibliographical schemes have these form divisions; those in the Expansive system closely resemble the Decimal divisions; while in the Subject system a similar result is obtained by a special table of numbers, called Categorical Numbers, which may be applied to any class, division, or subdivision as may be desirable. In the Decimal scheme, similar form sub-divisions are provided for many of the divisions; thus Law, 340, divides

340 Law (General).
340.1 Philosophy.
340.3 Antiquities.
340.7 Education, etc.

and even in more specific sub-divisions and sections, where they would be of advantage, form sub-divisions are supplied. Roman Law, 349.37, is an extreme case:

349.37 Roman Law.
349.3701 Philosophy.
349.3702 Compends.
349.3703 Dictionaries, etc.

All of these answer the same rule, that they divide the subject according to the form in which it is presented; and such divisions are a necessity in bibliographical classification.

21. A *notation* is a shorthand abbreviation of the name of a heading, similar in function to the abbreviations used by the chemist for the names of the chemical elements. It may consist of letters, figures or arbitrary signs, or of a combination of these. A notation consisting entirely of one kind of symbol is called a *pure* notation; that consisting of various symbols different in kind is a *mixed* notation. Generally speaking a pure notation is more simple and more easily apprehended than one that is mixed, and is therefore to be preferred. The usual forms are: arabic numerals read arithmetically; arabic numerals read decimally as in the Decimal scheme; the letters of the alphabet as in the Expansive; a combination of letters and numerals as in the Subject, Zion College, Library of Congress, Adjustable, Rational and other schemes; and Smith has proposed an ingenious scheme in which letters, figures, and mathematical symbols (such as Iu11+ for Fruits and Fruit Trees) are combined.

22. A notation must be

(1) Brief.
(2) Simple.
(3) Flexible.

To some extent simplicity and brevity are interdependent, but not absolutely so. A longer symbol, if of figures, as 94268, may be more easily apprehended than one of letters, as XPF, or B246 more easily than Bo+. Given, however, that the symbols used are of equal simplicity, the briefer the notation, the simpler, and therefore better, will it be. Of far more importance than simplicity or brevity is the flexibility of a notation. An ideal notation is one that permits the intercalation of a new number at any point without dislocating the sequence. This result is obtained in the Decimal classification by the addition of a decimal digit when any new number is required, beneath the heading nearest related to the new topic; thus, the new element Radium is an alkaline earth nearly related to Barium, 546.43, and a place can be made for it by adding a digit 1, or any other arbitrarily-chosen digit, after the 3; thus, 546.431. Radium, therefore, receives a specific place and the sequence has been preserved. In the Expansive scheme, the result is obtained by adding a letter; thus, if Yacht Racing is VGI, Steam Yacht Racing might be VGIA. The Subject scheme permits its numbers to be used decimally and numbers may be added as in the Decimal scheme. The value of such flexibility is obvious; however many new topics are discovered or treated of in books, the notation can always

accommodate them. This flexibility is variously termed adjustability, elasticity or relativity.

23. A principle of notation which is sometimes neglected is that it should illustrate the modulation of the classification. Thus, if the main classes are ten, marked by the digits 0—9, each of these classes throughout must carry the initial digit; hence 3 is Sociology, and every division of that class should be noted by this number; 34 is Law, and every sub-division of law should be marked 34; 342 is English Law, and every sub-division of that must be marked 342. Hence:—

342 English Law.
342.1 English criminal law.
342.11 English criminal law trials.
342.115 English criminal law trials: Judgment.

The number shows throughout the subordination of the topics. Again, the classification scheme of Bacon has many divisions and subdivisions, but has only three main classes, History, Poetry, Philosophy. In an ideal notation of this scheme therefore only three symbols could be applied, one each to the main classes, and these would be divided and sub-divided for the divisions and sub-divisions. From this we may conclude that the length of a notation is in inverse ratio to the number of main classes; the more main classes, the briefer the notation.

24. An index, as its name implies, is an alphabetical arrangement of all the terms in the schedules of a scheme, with the notation added to each. Such indexes are of two kinds, *relative* and *specific*. The relative index gives under each entry all the places in which the subject indicated appears in the schedules. Thus, under Steel we have the following entries in the indexes of the Decimal and Subject schemes:—

Decimal.			Subject.	
Steel.	building material	691.7	Steel	D456
—	buildings, library	022.21	— engraving	A718
—	engraving	762		
—	manufacture	672		
—	metallurgy	669 2		
—	piers and columns	721.35		
—	strength of materials	620.17		
—	structures	721.93		
—	works	725.43		
—	— engineering	621.7		

This does not indicate that the places do not appear in the Subject scheme for all the topics enumerated in the Decimal index, but merely that one shows as many standpoints or methods of treatment as possible, while the other

gives only the most apparent heading to which the topic is related.

The Application of Classification.

25. The actual application of classification to books cannot be taught satisfactorily without practical demonstration; and here we shall only lay down a few principles. The most important rule is that the subject is, except in the form classes, the arranging characteristic, and in classifying a book its title should be disregarded and the actual matter treated by it sought. This is not always a simple process, and problems will frequently occur. For example, "The Book Keeping of Grocery" would seem to be a work for the book-keeper; but, although its placing in book-keeping might be justified, its main appeal is to the grocer; and, remembering the rule that the most useful place is the best one in which to place a book, this should go with grocery accordingly. This leads us to a special service of rules:—

The book-keeping of a subject goes with the subject.
The bibliography of a subject goes with the subject.
The law of a subject goes with the subject.
The history of a subject goes with the subject.

And this rule that "the subject is the thing" will make it evident that a book of "Burn's Relics," must arrange with the life of Burns; that "Tennyson's Portraits" are not to be arranged under portraits, but under Tennyson.

26. A book should be classified mentally before appeal is made to the classification scheme. This will enable the classifier to see it in its true perspective. When using the scheme, apply the numbers from the main schedules, and never from the index. The latter should only be regarded as a check. Having chosen the heading, read upwards from it to the main heading of the class in order to see that the book classified modulates into that. If the main heading does not embrace the subject of the book, the placing is at fault. This is essential in using the Decimal Classification, where, in six different connexions, a heading may appear six times in the schedules.

27. Classify by the subject, and then by the form in which it is presented, except in the form classes where the form conditions the place of the work. When any doubt occurs as to the relative importance of subject and form, arrange under the one that seems most useful, and make a cross-reference from the other.

28. The most specific—or the most minute—heading that will take a work should be sought, and the work placed

there. When a book is composite in subject, but definitely dealing with two or three subjects, arrange by the predominating subject and cross-refer from the others. When the subjects are of equal importance, arrange by the one first treated and cross-refer. Should the work deal with more than three subjects, place it under the nearest general head.

29. When there is not a place in the scheme for the subject to be classified, the nearest related heading should be found, and a place should be made for it there. This we illustrated in the example of Radium (22).

30. When a work is of a complex composite nature, insomuch that it could be placed correctly in more than one heading, a decision must be made in favour of one heading.

Whenever a decision is made it should be recorded in the index of the scheme, or in some other way, in order that consistency may be obtained in placing future works.

31. Avoid placings which are critical. A schedule of religion, for example, contains places for atheism and agnosticism. To place a work on the New Theology under the former, or one on Unitarianism under the latter may be a proceeding harmonising with the classifier's idea of the nature of these works; but it is inadmissable in classification. A work must always be taken at its face value in classification; the personal equation must be absent.

32. Modifications of existing bibliographical schemes have been made by various classifiers. These should be viewed with suspicion. A scheme built on a sound basis is rarely modified except for some imaginary advantage. It is better to take the scheme as it stands, remembering Cutter's admonition, "Be minute, be minute, be not too minute," and only to modify when the advantage to be obtained is definite and unquestionable.

The theory of classification explained in these pages has been focussed on the three great bibliographical schemes in the following papers by the writer.

"Some Canons of Classification: applied to the Subject Classification." Library Association Record, v. 9, p. 425, August, 1907.

"The Expansive Classification: Thesis accepted for the Library Association Diploma." Libraco. 6d.

"The Dewey Decimal Classification after Thirty Years." Library Association Record, v. 12, p. 314, June, 1910.

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